Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ TP:\_\_\_\_\_\_\_\_\_\_\_\_  
**Due Date: Friday, May 12th**

Surface Area + Volume Design Project

**Geometry**

You have been given the task of designing a box for a company that will enclose a volume of 24 cubic inches. Your job is to create three different designs of a box that will all have a volume of 24 cubic inches. There are no requirements as to the surface area of your design.

Part 1. **Create three unique designs.**

* Each design should be represented in two ways:
  + 3D drawing with measurements labeled (on graph paper)
  + Net drawing with measurements labeled (on graph paper)
* Prove that the volume of each design is in fact 24 cubic inches.
* Calculate the surface area for each design.

Part 2. **Choosing the best design.**

1. After examining the three designs you created, which do you believe is the best design? Why?
2. If the company wants to minimize the amount of material needed to construct the box, which of your designs would you submit? *Explain your choice in complete sentences. Make sure to touch on why the other boxes would not be a good selection.*
   * Is your choice the same as part (a)? If no, why did you change your selection?
3. The cost of cardboard materials is $0.035 per square inch. How much would your selected design (from part b) cost to produce?
4. The company you are designing for wants to ship their boxes in a larger container that will hold 24 boxes at a time.
   * What could be the dimensions of the shipping container? Draw a sketch of what the container would look like (including how the smaller boxes would fit inside).
   * How many cubic feet will the shipping container hold?
5. Since you did such an excellent job with your initial design, the company now wants you to create a box that will enclose a volume of 72 cubic inches. How would you change the dimensions of the box you originally selected (from part b) to hold that amount?
   * Draw a 3D and net of the new box, with clearly labeled dimensions.
   * Explain the change in dimensions you had to make.
   * How much cardboard would your new, larger box require to construct?
   * How much would it cost to make using the $0.035 per square inch material?

Part 3. **Constructing your design.** The next portion of your task will be for ***extra credit.*** Meaning you can choose to complete it or not!

* Now that you have selected the best design of your box (part 2), you have the opportunity to **construct it yourself**. Using a material of your choice, construct a model of your design. The model should be to scale, meaning if your dimensions are your model will be that actual size. You can choose any method of keeping your model together. You are responsible for providing all materials.
* Your constructed design is due in class on Monday, March 27th.

***Suggested Project Timeline***

|  |  |
| --- | --- |
| Wednesday (in-class) | Part 1 completed |
| Wednesday (homework) | Finish Part 1 if not done so in class, start Part 2. |
| Thursdasy (in-class) | Part 2 |
| Thursday (in-class) | Finish Part 2(if needed) & construct your design |
| Friday | Entire project due! |

**Project FAQ (Frequently Asked Questions)**

Q: Where do I do this project?

A: On GRAPH paper. The entire project should be completed on graph paper.

Q: Do I need to create an actual construction of my design?

A: NO! It is only if you wish to receive extra credit. If you choose not to construct your design you still must turn in Part 1 and Part 2 in its entirety on Friday, May 12th.

Q: Can I create a different shape than a box?

A: Sure! But keep in mind that the volume should be 24 cubic inches. If you submit a design that is 24.8 cubic inches that will not fit the requirements.

Q: Do I have to answer the questions in Part 2 for all three of my designs?

A: NO! You are answering those questions based off of your answer for part b.

Q: Should I decorate the box I construct over the weekend?

A: Sure! Bonus points for creativity and humor.

Q: How many points is the project worth?

A: The point total will be a multiple of 2 . . . .

Q: Is this a group project?

A: NO! You should be creating your own designs and using your own mind in order to complete this project. A fully completed and well done project will have all work shown. If you turn in a project without any work that means you didn’t use your own brain!

Q: What if I have questions?

A: Ask your neighbor for help. If they don’t know, ask an instructor! If no one knows, you can maybe email Ms. Power, Mr. Gerber, or Ms. Ramos. Make sure it is a good question if you are going to take the risk of emailing a teacher!